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escape distortion during the further treatment. Care must be taken that the embryonic area remains moist. Drop on two drops of a  $\frac{1}{2}$  per cent. osmic acid solution, leave standing for two or three minutes until a slight browning is produced, wash off again with distilled water, strain with picrocarmine, which dyes the blastoderm after a variable time according to the intensity of the osmic acid action. The next step is important because it stops the further darkening by the osmium, which otherwise injures or ruins the specimen. Pour Müller's fluid, or 0.5 per cent. chromic acid solution on the slide and leave it over night. The next morning the blastoderm is ready for dehydration by alcohol, and mounting in the usual manner in balsam, or better in three parts pure Canada balsam mixed with one part d'Amman varnish, as furnished by the microscopical dealers.

Embryos mounted in this way make very perfect preparations, surpassing, indeed, those otherwise treated.

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### SCIENTIFIC NEWS.

— The method of teaching elementary botany at the Michigan Agricultural College, by Professor W. J. Beal, seems to us to be so excellent, that we extract the following reference to it in his address, entitled "Our Agricultural Colleges," given to the Connecticut Board of Agriculture, in 1880, and which has just been printed :

"Before the first lesson each pupil is given some specimen to study. If flowers or growing specimens cannot be had, give each a branch of a tree or shrub, which branch may be two feet long. The examination of these is made during the usual time for preparing lessons, and not in the class room. Without having the specimen in sight, they are to tell what they can about them for the next recitation. They can use books if they prefer, though it is better that they do not. No books can be found that will give much assistance on such a lesson. The time arrives, and the hour is mostly spent in hearing different members report their discoveries, until all have had a chance to add anything not noticed by any other member. The teacher suggests a few other points for study. The pupils are not told about things which they can see for themselves. An effort is made to keep them working after something which they have not discovered. If two members disagree on a point, on the next day, after further study, they are requested to bring in all the proofs they can to sustain their separate conclusions.

"It is often astonishing to notice how much is discovered by so many good eyes. For the next lesson the students review the first lesson, report on a branch of another kind of plant which they have studied, and notice the points of difference and simi-

larity between the two. In like manner new branches are studied and new comparisons made.

"For some weeks but little use is made of microscopes or text-books. In nearly all important cases specimens are examined, and a need felt for a name or a definition before these are given. After a few lessons answers to the following points are brought out:

"Is there any definite proportion of active to dormant buds in any year? Where do branches appear? Is there any agreement in growth as to length of branch and size of the annular ring each year? Is there any similarity of rapid or slow growth of all the limbs on a branch in each year? Is there any certain number of leaves on a year's growth, or any definite proportion between the length of internodes? Can the smallest, old, dormant buds be made to grow? Is there any order as to what buds grow and what remain dormant? How much and on what years did each limb grow? There are three ways of telling the age of a branch—by the bud-rings, stem-rings and color of the bark. The shape, other peculiarities, and variations of buds, and leaf-scars in any species are noted; also the arrangement and position of the buds and bud-scales. Is there any order in the arrangement of the specks on a branch? Do the specks change as the branch grows older, and if so how? How many leaves each year were required to build up the branch? How large were the leaves and the amount of surface exposed? Did the amount of growth in any year correspond to the number of leaves on the twigs and main axis? Does the ring of wood depend on the growth of the main axis? The arrangement of the scales of cones are studied in this connection. In each case the students are requested to try to classify the topics or place them under proper headings. They are now ready for a book lesson on branches, buds and phyllotaxis, and they will read it with interest and profit.

"In like manner any other topic can be taken up, provided plenty of specimens can be supplied, as roots, seeds, fruits, stamens, petals, sepals, leaves, etc. After each of these comes the study of the book. Beginners should study plants and refer to books, and not study books and refer to plants.

"Some of the above topics are admirably well adapted for theses or compositions. I usually give each student one or more of them each term. For the younger students this year, the following topics will serve as examples: 'Compare the leaves and young branches of the Scotch pine with those of the Austrian pine,' or 'black spruce and Norway spruce,' or 'sugar maple and red maple,' or 'butternut and black walnut.'

"As students advance in systematic botany and morphology, other subjects for theses are assigned, of which the following may serve as examples:

"The arrangement and development of parts of the flower,

with reference to its self-fertilization, or fertilization by insects, birds, winds, or by other means. Below are samples: Moth-mullein, dog-bane, common sage, thyme, red clover, plantain, milkweed, mallow, thistle, cleistogamous flowers of violet, campanula, iris, lobelia, martynia, Indian corn, wild balsam. One student may study the vines of dodder; one, the climbing of Virginia creeper; one, the twining of the wild morning-glory; one, cucumber tendrils; one unequal-lobed leaves; one, the time of opening and closing of flowers; several, the development of some irregular flowers; one, the order of dehiscence among anthers of a flower; one, the honey-glands of some flower; glands in other parts of plants than flowers; growing beans in all sorts of soil and with more or less light; the germinating power of weevil-eaten peas; the relative order of development of stamens and pistils of many plants of Indian corn; for what do ants visit plants?

"The theses were made up of original investigation and experiments, and were read in class. Students use stage microscopes. Later in the course, each is supplied with a good compound microscope, in a suitable room, where he works daily for a term. Pupils prepare their own slides, make notes and drawings, which are preserved at the college. Most of the time for the term is spent on one plant, a favorite of which is the common pumpkin."

—The British Association began its meetings Wednesday, Aug. 31, at York, when Professor A. C. Ramsay, Director-General of the Geological Survey of the United Kingdom, and of the Museum of Practical Geology, resigned the chair; and Sir John Lubbock, president-elect, assumed the presidency, and delivered an address. On Thursday evening there was a soirée in the assembly-rooms and concert-rooms. On Friday evening Professor Huxley discoursed on the "Rise and Progress of Palæontology." On Saturday evening Professor Osborne Reynolds, F.R.S., delivered a popular lecture to the working classes. On Monday evening Mr. Spottiswoode, president of the Royal Society, gave an address on the "Electric Discharge, its forms and its functions." On Tuesday evening there was a soirée. On Wednesday, September 7, the concluding general meeting was held at 2.30 P.M.

—The *Penn Monthly* for August contains an excellent biographical notice of the late Professor S. S. Haldeman, by Professor C. H. Hart. Among recent deaths of scientists we have to chronicle that of Dr. Ferdinand Keller, the distinguished Swiss archæologist and author of a well known work on Lake dwellings. He died at Zurich, July 21, aged 80 years. A prominent English botanist, H. C. Watson, born in 1804, and author of several works, including "Cybele Britannica," died in July. Dr. Phil. de Rougemont died at Neuchatel, May 27.

— Among recent Bulletins of the Census are the statistics of the fisheries of the Great Lakes for 1879, prepared by Mr. F. W. True from notes furnished by Mr. Ludwig Kumlien; the total value is \$1,784,050. The production of anthracite coal in Pennsylvania for 1880 was 27,433,329 tons, a gain of 75.9 per cent. over 1870. The production of salt was a little less in 1880 than in 1870. Of cotton 5,737,257 bales were produced in 1880, Mississippi producing most, Georgia being the next heaviest producer.

— Professor Snow of the University of Kansas and his party, recently had a narrow escape from death, at the hands of the hostile Apache Indians, in New Mexico. They were besieged for three days in the water cañon of the Magdalena mountains, and made their escape on foot to Socorro, after concealing their personal property. On the road they passed a party of freighters lying dead beside their wagons, victims of the Indians' murderous propensities.

— Two of the parties of the U. S. Geological Survey under Major J. W. Powell, are at Fort Wingate, N. Mex. These are under the immediate direction of Messrs. Thompson and Gore. Mr. and Mrs. James Stevenson, of the same survey, are also there, preparing for an investigation into the archæology and ethnology of the surrounding region. There is some risk that the operations of these parties will be interfered with by the hostile Apaches.

Carlile P. Patterson, Superintendent of the U. S. Coast Survey, is dead. His successor has not yet been appointed, but it is anticipated that it will be Julius E. Hilgard, for a long time the able second officer of the survey.

— Mr. G. Brown Goode has been appointed, by Professor Baird, Curator of the National Museum, Washington. An excellent appointment.

— The German Association of Naturalists and Physicians was to hold its meetings at Salzburg from Sept. 17 to 24.

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## PROCEEDINGS OF SCIENTIFIC SOCIETIES.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.— The thirtieth meeting was held at Cincinnati, Aug. 17–23, 1881. The meeting was as largely attended as any ever held except the last (Boston) meeting, and everything was done by the hospitable citizens of Cincinnati to render the session pleasant and profitable. The next meeting will be held at Montreal. Dr. J. W. Dawson, of Montreal, was elected president, and William Saunders, Esq., of London, Canada, general secretary, for the next year.